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ABSTRACT

This paper provides an evaluator's perspective on the main activities and lessons learned from the evaluation of Alliance+ in the program's first year of operation. The Alliance+ project is a national training program funded by the U.S. Department of Education with contributions from project partners and the participating school systems. The program's goal is to provide hands-on training for K-12 teachers to integrate the Internet resources into their classroom curricula and improve science and mathematics education. The program uses a two-tiered model in which community college faculty train cadres of educators (mentor teachers) in the 30-hour graduate course. Evaluation criteria and first-year findings are presented for each component of the logic model used to build the program. These components were: (1) Internet connectivity and access; (2) training course and curriculum; (3) specific curriculum models to integrate technology into the classroom; (4) mentoring and support; (5) structural changes; and (6) trained teachers. Findings are based on site visits, a teacher questionnaire completed by 96 teacher mentors, and focus groups of teachers. The first-year evaluation has produced a number of significant findings that are being used to improve the program and extend its activities. (Contains 2 figures and 25 references.) (SLD)

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The Alliance+ project is

(A) a science education project.

(B) a technology-in-education project.

(C) a professional development project.

(D) a school reform and improvement project.

(E) all of the above.

Lessons Learned From the Evaluation of Alliance+: An Internet-in-Education Professional Development Program

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Introduction

This paper provides an evaluator's perspective on the main activities and lessons learned in the evaluation of Alliance+ for the period October 1998-December 1999, corresponding to the first year of operation of the project. First, an overview of the project is presented. Second, the evaluation framework and main findings to date are discussed. Finally, a summary, conclusions, and recommendations for future activities related to the evaluation of Internet-based projects is offered.

Given the wealth of information resources for education and high degree of interactivity provided by the Internet, there exists the expectation that, well used, the Internet has the potential to improve learning for all children. There is, however, little data to substantiate these expectations on a large scale. The evaluation of the Alliance+ project offers a unique opportunity to assess the extent to which the Internet can be an effective tool to significantly improve teaching and enhance learning. Although Internet use in the classroom is a rather recent phenomenon, the implementation of the Alliance+ project has benefited from the experiences gained over the past ten years by the Center for Improved Science and Engineering Education (CIESE) at Stevens Institute of Technology with the Alliance project, a precursor of Alliance+, the New Jersey Networking Infrastructure for Education (NJNIE) project, and other professional development initiatives to help teachers integrate information technology in the classroom. Similarly, the evaluation of Alliance+ has gained from the experiences of Educational Testing Service in the evaluation of the two projects mentioned above and other professional development projects as well. The lessons learned in the context of the Alliance+ project are thus an important contribution to the improved understanding of the technical, organizational, and informational requirements of Internet-based education.

Overview of the Alliance+ Project

The Alliance+ project is a national training program funded by the U.S. Department of Education, with significant financial contributions from project partners and the participating school systems. The program' s goal is to provide hands-on training for K-12 teachers to integrate the Internet resources in their classroom curricula and improve science and mathematics education. The project is a joint effort of the Center for Improved Engineering and Science Education (CIESE) at Stevens Institute of Technology in New Jersey, the Polaris Career Center in Ohio, the League for Innovation in the Community College in California, three community colleges (Cuyahoga Community College in Ohio, Miami-Dade Community College in Florida, and Maricopa Community College in Arizona), other partners, and the participating school systems in Cleveland, Miami and Phoenix.

The training program is being implemented using a two-tiered model in which community college faculty (Core Team Trainers) train cadres of educators (Mentor Teachers) in the 30-hour graduate-level course. These mentors then train classroom teachers (Mentee

Teachers) in their schools and districts. Begun in October 1998, Alliance+ aims to provide training for over 9,000 teachers. To accomplish this purpose, CIESE has developed an extensive training program for educators called the *Savvy Cyber Teacher* ™that consists of 10 three-hour hands-on workshops. In addition to the training program, a set of support electronic materials, including Internet-based classroom projects, have been developed.

Two companion papers for this AERA presentation provide a detailed description of the project and the context for the evaluation work reported in this paper. Edward A. Friedman (2000), the project director, has written about the conceptual framework and organizational structure of the project. Joshua D. Baron and Mercedes McKay (2000), responsible for curriculum development and training, have prepared an overview of lessons learned in the implementation of the training program. In addition, four educators, Kelly Graham (2000), Terri Egleberry (2000), Lois Klamar (2000), and Lani Ritter (2000), have written papers of their experiences with Alliance+ along the main dimensions of the evaluation framework.

Evaluation Framework[1] and First Year Findings

Logic Model

Figure 1 depicts a simple logic model for the evaluation of the Alliance+ project. The model is an attempt to link inputs (represented by rectangles) to outputs or terminal goals (represented by circles). Hexagons stand for critical intermediate goals. This model is based on the notions of *causal mapping* (Venezky, 1999), *systems thinking* and *task analysis* (Romiszowski, 1986), as these apply to the design, implementation, and evaluation of a complex professional development program such as Alliance+. In addition, other sources were consulted to identify criteria for effective technology-based professional development and instructional programs. One set of materials that proved to be particularly helpful were the papers presented at the *Secretary's Conference on Educational Technology: Evaluating the Effectiveness of Technology*[2] on July 12-13, 1999 in Washington, DC. These papers reflect the latest research and promising practices in the field (e.g., McNabb, Hawkes, & Rouk, 1999; Honey, Culp, & Carrigg, 1999; Baker, 1999).

As summarized by McNabb, et al. (1999), the following seven critical issues emerged from the interaction among stakeholders at the conference:

- The effectiveness of technology is embedded in the effectiveness of other school improvement efforts.
- Current practices for evaluating the impact of technology in education need broadening.
- Standardized test scores offer limited formative information with which to drive the development of a school's technology program. Most schools are looking for additional means for collecting useful data for this purpose.
- Schools must document and report their evaluation findings in ways that satisfy diverse stakeholders' need to know.
- In order for evaluation efforts to provide stakeholders with answers to their questions about the effectiveness of technology in education, everyone must agree on a common language and standards of practice for measuring how schools achieve that end.

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[1] Adapted from Yepes-Baraya (1999, August).

[2] Papers presented at the 1999 conference are available at: http://www.ed.gov/Technology/TechConf/1999/

- The role of teachers is crucial in evaluating the effectiveness of technology in schools, but the burden of proof is not solely theirs.
- Implementing an innovation in schools can result in practice running before policy. Some existing policies need to be "transformed" to match the new needs of schools using technology.

These critical issues point to the importance of developing a broad, systems-based evaluation model, such as the model in Figure 1, that includes the main inputs, outputs, and processes of the Alliance+ program and takes into account the needs and contributions of diverse stakeholders.

From the perspective of a mentee teacher, five main inputs have been identified. The first input is connectivity and access to the Internet. Although this is not explicitly an Alliance+ input, it is a *sine qua non* for the successful implementation of the project. The second input is the *Savvy Cyber Teacher* ™training course and curriculum developed and refined by the project's core team at CIESE and taught by community college trainers and mentor teachers from the same schools as those of the mentee teachers. The third input corresponds to Internet applications linking what was learned in the training course to specific curriculum frameworks and standards. The fourth input is the mentoring and support provided by mentor teachers and core trainers at the community college level. Finally, the fifth input refers to structural changes at the district and building level, that have an impact in the classroom and may be necessary to effectively integrate the Internet into teaching and learning.

The *innovation* provided by Alliance+ results from the interaction of these inputs and the participating teachers in the context of their schools. It consists of *trained teachers with the capacity to integrate technology in the classroom that are supported by the school's administration to take full advantage of real-time data bases, collaborative projects, and other resources uniquely available on the Internet to improve teaching and learning*. The trained teachers are considered to be a critical intermediate goal – and not a terminal goal – because their improved teaching ability and facility with information technology are means for achieving specific students goals and not ends in themselves. The same can be said of engaged students, the other critical intermediate goal. Student engagement is a necessary but not a sufficient condition to improved academic achievement and improved ability to use technology.

Framework and First Year Findings

The logic model described above is the basis for the evaluation framework depicted in Figure 2. For each component in the model, the evaluation framework includes the following elements: the main evaluation criteria, evaluation methods to collect and analyze data to determine progress made toward the evaluation goals, status with respect to the evaluation goals at the end of the first year, and evaluation activities planned for the next evaluation period. As data are collected and analyzed and new information about the workings of the project is obtained, the evaluation framework will be updated and new evaluation activities will be planned and carried out over the next evaluation period.

Evaluation criteria and first year findings for each component in the model are described below. Regarding the instruments or techniques used in the documentation and evaluation of Alliance+, in some instances they were developed specifically to collect information on one or two components of the model. In other instances, however, the same instrument or technique was used to simultaneously collect information on four or five components. Instruments, techniques, and documents used include the site directors' quarterly reports, pre and post training surveys,

electronic questionnaires, school visits and focus group meetings, and a teacher questionnaire administered in the fall of 1999.

1. Internet connectivity and access

Two main criteria with respect to Internet connectivity and access are: (1) the availability of an Internet connection at school and/or in the classroom, (2) and teacher and student access to use Internet resources in the classroom. A third criterion that has been identified in the first year of collecting evaluation data is the availability of an Internet connection at home for teachers. Graham (2000) and others suggest that, given the tight schedule of most teachers during the school day, having an Internet connection at home affords them time after school and on weekends to locate resources and plan activities for their classes. A fourth criterion is the availability of technical resources and support services to provide continuous connectivity and access to the Internet.

Data collected in the evaluation of Alliance (a precursor of Alliance+) in the spring of 1999 from a sample of participating teachers suggest that there is room for improvement in Internet connectivity and access (Yepes-Baraya, 1999, June). Two different measures exist. The first one is a direct measure obtained from teachers' responses to the training surveys. Computer use in the classroom is relatively high for both mentors and mentees (93% vs. 81%). It is significant, however, that only 60% of mentees have an Internet connection in the classroom (vs. 75% of mentors) and that only 32% use the Internet in the classroom every day or 2-3 times a week (vs. 71% of mentors). The second measure is indirect and was obtained from responses to E-Quest, an electronic questionnaire. Roughly 57% of all respondents, mentors and mentees, reported some type of involvement in Internet-based activities. This percentage is probably higher than the actual number because of the self-selected nature of the respondents.

Findings from school visits and focus group meetings in Cleveland, Miami, and Phoenix in the fall of 1999 suggest that lack of connectivity, lack of student access to computers, and technical problems continued to impede the effective integration of technology in the classroom (Yepes-Baraya, 1999, December). Although some school districts can boast of "near to ideal" technology environments, other districts do not have the resources to get the project off the ground. Since the E-rate law favors rural schools over suburban schools, suburban schools in the project, in Phoenix, for example, are adversely affected. Typical comments from the participants follow.

- *A middle-school principal in Miami - "We are very lucky. We have a brand new facility. We have 2 computers in each classroom, and 3 computer labs with a total of 90 computers. Altogether, we have 400 computers in the system."*

- *A middle-school ESL teacher in Miami - "The problem is not enough computers. Yes, there is a media center, but the demand is high."*

- *A technology mentor teacher in Phoenix - "We have 100% connectivity in our school, although the K-3 computers are not connected to the Internet."*

- *A mentor teacher in Phoenix - "...another problem we have is lack of a T-1 connection. We have 256K lines; it hasn't been that bad, but sometimes it's slow."*

- *A mentor teacher Phoenix - We have one Internet connection for 1400 K-6 students. It is difficult to get teachers to try it. It's frustrating because the system crashes often. We need to be patient."*

- *A mentor teacher Phoenix - "Connectivity continues to be a problem. Even if the connection is present, speed can be a problem. How can you justify those kids sitting down 45 minutes doing nothing, waiting for the system to download?"*

- *A mentor teacher in Cleveland - "Many teachers have laptops, a connection, and other resources, yet they were not receptive to using technology in the classroom."*

Responses to a teacher questionnaire administered in the fall of 1999 (Yepes-Baraya, 2000, March) confirm the results above. Of 96 questionnaires returned, representing about 50% of all mentors trained before the fall of 1999, 71 had not obtained an Internet connection in their classroom. One-third of the 25 respondents that did have an Internet connection indicated that the number of computers connected to the Internet accessible to their students was not sufficient for instructional purposes. However, many of those mentor teachers without a connection at the time of the survey indicated that their schools were in the process of obtaining the connection and they would soon be able to start using Internet resources in their classrooms.

2. Training course and curriculum

Three are the main criteria to evaluate the training course and curriculum: (1) the degree of implementation of the training (number of courses offered, number of teachers reached), (2) the degree of teacher satisfaction with the quality of the training and the curriculum, and (3) the level of comfort of teachers with the Internet as a tool for teaching. A fourth criterion, the degree of integration of the training in the classroom, will be considered under component 6 in the logic model.

Data on teacher satisfaction with the quality of the training and the curriculum was collected in the evaluation of Alliance and Alliance+. The data from Alliance is from two different sources, but both sources reveal that participant satisfaction with the training is uniformly high (Yepes-Baraya, 1999, June). Participants completing feedback forms administered at the end of ten three-hour training sessions evaluated the quality of the course content as *high* or *moderately high*, and the quality of the training as *excellent* or *very good*. Respondents to an electronic questionnaire found the training experience to be highly positive. Terms like *enjoyable, excellent, exciting*, and *challenging* were used to describe the course. Although some participants found the content challenging, these participants stated that the course was useful and readily applicable in the classroom. Similarly, data collected in the evaluation of Alliance+ shows an overwhelmingly positive response to the training received (Yepes-Baraya, 1999, May). Most of the reasons given to explain a high level of satisfaction with the course made reference to having learned something new and useful, to specific skills learned or tools mastered, or to relevant aspects of the training, such as the organization of the course or the support received. The few negative comments had to with the level of complexity and pace of delivery of the material: While some thought the training was too basic, others considered it went too fast.

Overall participants in the focus group meetings referred to the course as a *model of user-friendly instructional design*. There are, however, a number of issues related to the course that need to be addressed. One issue is scheduling the course over a sufficiently long period to allow participants the time needed to apply what they learned and reflect on their experience.

Another issue is the increasing number of prospective trainees lacking basic computer skills required to take full advantage of the course. Some typical participant comments follow.

- *A middle-school mentor teacher in Miami - "The course was excellent, but it's weak in the language arts curriculum."*
- *A middle school administrator in Miami - "Training over the summer was not the way to do it. The whole course was compressed into one week, but there were no opportunities for teachers to apply what they learned. It should be spaced out over a ten-week period."*
- *A mentor teacher Cleveland - "One of the benefits of the Alliance+ program is that it's so concise and clean. It's been put together so that you don't have to go outside to search for additional information. It's a guided document."*
- *A mentor teacher in Cleveland - "Many teacher mentees don't have the required basic technology skills to take full advantage of the course. We need to define a set of prerequisite basic skills for all prospective mentees."*

As shown in Table 1, respondents to the teacher questionnaire administered in the fall of 1999 did not identify lack of adequate preparation to work with technology as a significant problem. However, it remains to be seen if this sentiment continues to be the norm as the project expands and larger numbers of teachers complete the training.

Table 1. Problems Identified by Alliance+ Mentor Teachers (Yepes-Baraya, 2000, March)

Problem	Cleveland N	Miami N	Phoenix N	Totals
1. Connectivity/access to computers/Internet	6	2	6	14
2. Other technology-related problems	6	3	4	13
3. Lack of adequate preparation to work with technology	1		3	4
4. Lack of specific curriculum models to follow	1		2	3
5. Competition from other technology-based programs	1		1	2
6. Competition from other academic programs	4		5	9
7. Lack of support from the project				
8. Lack of support from school	1			1
9. Lack of time	8	3	5	16
10. Other problems	3		2	5
Totals	31	8	28	67

3. Specific curriculum models to integrate technology in the classroom

There are three main criteria to evaluate this component: (1) the availability of specific curriculum models for teachers to integrate the Internet in the classroom, (2) technical support and resources to achieve this end, and (3) the degree and quality of the implementation. The literature suggests (e.g., Venezky, 1999) that teachers need specific models to integrate technology in the classroom that go beyond the information provided in a training course. Effective models provide information relative not only to curriculum, technology, and assessment practices, but, more importantly, about changes in the traditional roles of teachers and students. Effective models are descriptive and flexible as opposed to being prescriptive and rigid. Alliance+'s *Savvy Cyber Teacher™* course and the collaborative projects available through CIESE

offer examples of different types of applications of the Internet in the classroom. The collaborative projects, in particular, provide a framework that has achieved a measure of success with teachers outside of Alliance/Alliance+.

Data on the degree of integration of the training in the classroom is available from Alliance and Alliance+. An indirect measure of the impact of the training on teachers' technology skills and practices can be obtained by comparing data from Alliance mentors and mentees (Yepes-Baraya, 1999, June). Overall, significantly larger proportions of mentors indicate being computer and Internet proficient and frequently using the Internet for specific purposes. Two extreme differences are the proportion able to create Web sites (95% of mentors vs. 13% of mentees) and the proportion able to publish a Web site to the Internet (87% of mentors vs. 7% of mentees). In interpreting these results, it should be noted that one-third of the mentors completed the survey at the *end* of their training and two-thirds did so approximately six months *after* the training. Mentees, on the other hand, completed the survey *before* they had had the benefit of receiving the training. Thus it can be assumed that one plausible explanation for these differences is the training and the opportunities it provided. Evaluation data from Alliance+ indicates that some teachers are already implementing what they learned in the training or planning to do it in the near future (Yepes-Baraya, 1999, May). Some of the Internet applications being implemented or that will be implemented include: the creation of Web pages to be used with students, participation in collaborative projects, use of activities with real-time data, and publishing children's stories. These applications cover a wide range of academic and nonacademic subjects, including science, mathematics, English, history, geography, sports, and career planning.

Participants in the focus group meetings stated that the collaborative projects on the CIESE Web site and project listservs are valued sources of curriculum materials. Some typical comments follow.

- *A middle-school mentor teacher mentor in Miami - "The collaborative projects offered through the Stevens Web site are an excellent source of curriculum materials. Many can be aligned with the F-CAT requirements."*

- *A mentor teacher Phoenix - "I find a lot of things in listservs and I pass them on to my mentees. I give them a lot of support."*

- *A mentor teacher in Cleveland - The nice thing that Stevens does is to match up their activities with state guidelines. They help teachers make decisions regarding curriculum."*

As shown in Tables 2 and 3, below, respondents to the teacher questionnaire are involved in different types of Internet-based activities, including research, use of real-time data bases, problem solving, and collaborative projects. Science, mathematics, and all other core curriculum subjects are represented in the learning activities identified by respondents.

Table 2. Internet-based Activities Performed with Students (Yepes-Baraya, 2000, March)

	Collaborative Projects	Work with Real-Time Data	Contact Experts	Other	Totals
Cleveland	6	6	2	4	18
Miami	2	5	5	2	14
Phoenix	9	3	6	2	20
Totals	17	14	13	8	52

Table 3. Examples of Internet-based Activities of Alliance+ Mentor Teachers (Yepes-Baraya, 2000, March)

Activity	Type	Subject	Grade Level
Communities Collaborative Project	Collaborative project	Social Studies	3
Monster Writing Collaborative Project	Collaborative project	English	2-4
Stock Market Simulation	Real-time data	Math/Soc. Stud.	8
Studying Landforms and Volcanoes	Research	Science	4
Graduation Outcomes Project	Research	All core	8
Scavenger Hunt	Research	Social Studies	4
Research Topics for Writing Lessons	Research	English	4
Tracking the Weather	Real-time data	Science	3
Cleveland History	Research	History	3
Bridge Construction	Research	Science/Tech.	3-5
Word Problem Solving/Grocery Prices	Problem solving	Math	6-7
Hurricane Tracking	Real-time data	Technology	6-8
Real Time Data Activity	Real-time data	Computers	7-8
Globelearn – virtual expedition	Collaborative project	Geography	6
The Day I was Born	Research	All core	6-8
Exploring the Oceans	Research	All core	6-8
Weather Tracking	Real-time data	Science	7-8
Monster Project & E-pals	Collaborative project	English/Math	1-7
Mind's Eye Monster Project	Collaborative project	English	K-8
Globelearn – virtual expedition	Collaborative project	Geography	5
Galapagos Project	Collaborative project	English/Science	5-6
Keiko's Relocation	Research	Science	4
The Square of Life	Collaborative project	All core	1-6
Down the Drain	Collaborative project	Science	4 ESL
Visit Monet's Garden	Research	English/Art	3

4. Mentoring and support

This component has been in place since the beginning of the project. Initially, the evaluation focused on support provided during the training. It is apparent, however, that the biggest challenge for many teachers occurs when they return to their classrooms and attempt to apply in their teaching what they learned in the training. Hargreaves, Moore, & James-Wilson (1997, February) suggest that teachers need time to talk about their experiences as innovators and "think their way through new practices with colleagues." Thus two general criteria for the evaluation of this component are: (1) the degree to which mentors and core trainers at the community college level are responsive to the implementation needs of teacher mentees, and (2) whether the training and support services that mentors and core trainers are receiving from CHESE is sufficient to allow them to adequately perform their duties.

Comments addressing this component tended to dominate the focus group meetings conducted in the fall of 1999 (Yepes-Baraya, 1999, December). A number of issues surfaced, including the need for ongoing mentoring and support, the lack of time and resources for teachers to be mentors, and the identification of effective mentoring candidates and strategies. Typical participant comments follow.

- *A mentor teacher in Miami - "Not everyone completing the course is ready to implement technology in the classroom. Absolutely not. They're exposed to a lot of things. They need time to think and to plan how to fit in the lessons I create for them."*

- *A mentor teacher in Miami - "I don't have time to meet with my mentees. The information conveyed is shared as we meet in the hallways on our way to a classroom or at lunch."*

- *A school principal in Miami - "The dilemma is how to bring mentors and mentees together without money. We do not have time to release them."*

- *A mentor teacher in Miami - Some teacher mentees have made monumental gains, but are still not up to the level that is expected."*

- *A school principal in Miami - "Our technology specialist works with teachers to understand what they are doing. She proposes projects to them that they can do over the Internet."*

- *A technology mentor teacher in Phoenix - Most teachers that come into the lab drop off their kids and I take over. But more and more teachers who have taken the Savvy Cyber Teacher[IM] course stay in the lab and work with their kids. The course has sparked a lot of interest in our campus. The teachers are fired up."*

- *A mentor teacher in Phoenix - "Many teachers are initially scared, but after the third week they start to believe they are capable. We incorporate in each session things that they can use in their own classroom; things that they can use immediately. It makes a big difference if they can relate to the material presented."*

- *A mentor teacher in Phoenix - "They have access to my lab and to myself all day long."*

- *A mentor teacher in Cleveland - "Even if administrators require the use of technology, some teachers may still not use it because of lack of know-how."*

- *A mentor teacher in Cleveland - "The more senior teachers don't want to be embarrassed. They won't admit that they need help. What I do is work one-on-one with them. I give them a small dosage, 10-15 minutes at a time, and lend them laptops over the summer. You'd be surprised at the results."*

5. Structural changes

This component can be regarded as a logical extension of the support required by teachers to change their classroom practices in ways to benefit students. Support is needed not only from the core trainers and mentor teachers, but, just as importantly, from the school administration. Venezky (1999) has remarked that few technology-in-education programs explicitly include organizational changes as one of the required inputs for the successful integration of technology in the classroom. In his review of systemic reform, Fullan (1994) argues that neither top-down nor bottom-up strategies for educational reform work. He proposes a sophisticated blend of the two. Hence, the general criteria for the evaluation of this component are administrative support to make time, resources, and support services available to teachers, and the willingness of trained teachers to integrate the Internet in the classroom.

Findings from the school visits and focus group meetings in the fall of 1999 (Yepes-Baraya, 1999, December) identified the need, effect, and nature of some of the administrative and

organizational changes required to facilitate the integration of technology into teaching and learning. Typical participant comments follow.

- *A school principal in Miami - "Our staff development model is a weekend-model and a summer institute model. It's very important to leave teachers in the classroom when children are there. We have obtained grants to compensate teachers for their time."*

- *A school principal in Miami - "Every teacher in our school is on e-mail. No hard-copy memos are sent. You have to use technology. That's a critical first step. You have to crawl before you can walk or run."*

- *A technology mentor teacher in Cleveland - "Administrators should require the use of technology on a weekly basis as part of the teachers' lesson plans. Otherwise many teachers may not feel motivated to do it because, initially, technology requires more effort than opening a textbook."*

Another type of change needed to support the Integration of the Internet in teaching involves not only administrators, but also technology staff and teachers who originally were trained to use technology as an add-on for the development of specific skills. According to Ritter (2000), "issues of technology are not the only challenge to the transformation of teaching and learning with the Internet. A paradigm change is needed in the use of technology in the classroom: from *technology as an add-on for drill and practice* to *technology as tool to teach understanding and higher-order skills*. In order for this change to take place, administrators, teachers, technology staff, and the community-at-large need to be made aware of: (1) the unique and compelling resources available on the Internet, and (2) how these resources can be integrated into teaching and learning.

6. Trained teachers

This is a critical intermediate goal to improve teaching effectiveness, and one not easily achieved in systemic reform (David, 1994). The key issue is to identify teacher behaviors and practices indicative of success in implementing technology in the classroom. Certain assumptions need to be made based on the school reform literature and the literature on inquiry learning and constructivist practices. Some of these assumptions are included in the CIESE document *Education for the Next Millennium – How to Transition from Classroom-Based Instruction to Internet-Based Learning* (Baron, 1999, April). In general, and depending on the grade level, teachers are expected to foster higher academic achievement by encouraging inquiry-based learning and self-directed student learning, and providing a variety of resources and support. Although this approach may be interpreted by some as *laissez-faire*, it is important to remember that most of the learning goals are specified in the national, state or local curriculum frameworks and standards. Innovation is expected, however, in *how* the learning goals are attained, the degree of individualization of instruction achieved, and in the relationships that develop between teachers and students, between one student and other students, and between the classroom or the school and the community of practitioners of a given discipline in the school's immediate locality, the country and the world.

Criteria for the evaluation of this outcome in the model include teacher behaviors and practices identified as desirable. Examples of desirable behaviors and practices might include new forms of classroom organization, new roles for students and teachers, and the use of learning technologies in appropriate ways. Classroom observations, analysis of student products and

assessments, analysis of Web pages and other electronic media, and teacher interviews are some of the methods that will be used to document and evaluate this component.

Findings from the school visits in the fall of 1999 (Yepes-Baraya, 1999, December) suggest that the Internet is taking root in the classrooms of Alliance+ mentor teachers. The three vignettes presented below are typical of what other mentors are doing with technology in the classroom. With modest technology resources, these teachers appear to already be integrating the Internet in the classroom. Ms. Posada in Miami has been able to integrate the Internet with other technology-based resources in her school and with more traditional teaching strategies as well. To a considerable extent, she has also been able to individualize her instruction. Mr. Hoffman in Phoenix has been able to engage his students in inquiry-based science learning and foster in them the development of laboratory skills, such as recording data, that only 1% of elementary students in the U.S. have attained (Yepes-Baraya, et al., in progress). Among other skills, Ms. Brown in Cleveland is teaching her students about the importance of using everyday language and sentences that are meaningful to communicate about data and abstract information. Although the students in these classes have limited access to computers in the classroom, their subject matter knowledge and problem-solving skills appear to have been enhanced by the use of technology.

- *Ms. Posada,[3] a Miami middle-school mentor teacher, has 3 computers in her classroom connected to the Internet and one printer. In addition, there are 20 computers with Internet connection in the Media Center. On the topic of absolute value, she uses a combination of media with her students in the classroom. On the blackboard, she clearly explains the topic and provides examples, at the same time that she encourages student participation. As she meanders up and down the rows of chairs, arranged in a traditional way, she checks the students' entries in their journals. Three students at a time use the school network to access School Vista, a basic skills math program. The remaining students work at their desks. Ms. Posada moves around to supervise both those students working on the computers and those working at their desks. She then organizes the students in teams to solve a real-world problem, related to the learning topic, obtained from the Math Forum Web site, run by Swarthmore College. Each member of the team is assigned a specific role. Ms. Posada checks out the teams' answers before the students can input them into the computer. According to Ms. Posada, students also create and submit new problems to the Math Forum Web site. If their problems are selected, the class school and the school receive an online acknowledgement. Ms. Posada feels that if she had more computers, more students could have direct Internet access. However, she states that current use is "good enough," given the resources available.*

- *Mr. Hoffman, a fifth-grade mentor teacher in Phoenix, has one computer connected to the Internet in his self-contained classroom. There are also 30 networked computers with Internet connection in the Computer Lab. Mr. Hoffman's students visit the Computer Lab once a week for about an hour. About 80% of the 30 students in this class are of Hispanic origin, with the remaining being white or of Somali or Iraqi origin. All students are on free or reduced lunch. The class is participating in three Internet-based collaborative projects: the Teddy Bear project, the International Boiling Point of Water project, and a project related to ecology and conservation in Peru. The Teddy Bear project involves getting a stuffed toy bear from a classroom in one of many countries (in this case, Mongolia). The bear goes home with different students, and the students write about what the bear "did" and "saw." Accounts of the bear's "experiences" are then sent via the Internet to the classroom in her home country. On the day of the visit, the class was working on the International Boiling*

[3] Given the confidentiality promised to participants, fictitious names will be used throughout the report.

Point of Water project. Mr. Hoffman had set up ten stations in the classroom, each of which had identical equipment to boil water and measure its temperature. He had prepared a form for the students to record the temperature of water at different intervals. All students were observed reading the thermometer and entering data in the form provided. Mr. Hoffman explained that other data is obtained, such as the volume of water, room temperature, and elevation of the school site (or town), and transmitted over the Internet to the project's manager. Data from schools all over the world can then be printed out and the students can be asked to find trends in the data and produce plausible explanations.

- *Ms. Brown is a third-grade mentor teacher in a Cleveland school with a majority African American student body. On the day of the visit, the class is using the only computer in the classroom and a big-screen monitor to complete a chart on the weather conditions and temperature in six U.S. cities, including Cleveland. Groups of three or four students were observed sitting around small tables individually filling in their charts with information from the monitor. As they completed their charts, students were asked to interpret them by making true statements about the data contained therein (for example,"today all the cities south of Atlanta had temperatures above 65 degrees Fahrenheit."). In the same school, Ms. Santillo is a computer lab teacher. On the day of the visit, she has about 25 fifth-graders, each sitting in front of a PC connected to the Internet, studying nutrition. Their task is to use the Ask Jeeves search engine to find the nutritional content of common foods. From the beginning, it is evident that despite the teacher's careful instructions, some children are having a hard time following the links to the Web site with the desired information. Ms. Santillo realizes that some students are "lost" and interrupts her instructions to help individual students get back on track. After much effort, the teacher verifies that all students are on the same Web page and then proceeds to ask them specific questions related to the learning topic.*

7. Engaged students

This is the other critical intermediate goal on the path to improved learning and student outcomes. David (1994) cites many examples on a small scale of how technology can be used to transform teaching and learning (Pogrow, 1991; Stearns et al., 1991; Tierney et al., 1992). One factor these experiences with technology have in common is that "they are based on the premise that understanding and problem solving require activities that engage students in constructing knowledge" (David, 1994). Student engagement can be manifested in different ways, but overall it is likely to include more time spent on task, more self-directed learning, less tardiness and absenteeism, increased participation in special projects, and improved grades.

In the course of the school visits and classroom observations performed in the fall of 1999, there were many opportunities to see students engaged in inquiry learning, collaborating with peers, and presenting the findings but no systematic effort was made to assess this component. Documentation of student engagement and solicitation of student input will be on the evaluation agenda for the fall of 2000.

Student Outcomes

With the emphasis of the Technology Challenge Grant Initiative on reaching *all* students, measuring access and achievement of under-represented minority students relative to the majority students will be one of the main evaluation criteria. Achievement will be defined broadly to include not only achievement in the key curriculum areas in which technology has been integrated (e.g., science, mathematics, or social studies), but also improved ability to use technology for different purposes, and, in general, improved attendance and graduation rates.

It is important at this stage in the project to agree on a set of common indicators and measures for each site or, in some cases, each school district, that can be used to obtain baseline data and gauge student progress. Involvement from the main stakeholders will be sought in 2000-2001 to identify these indicators and obtain buy in for data collection and research purposes.

Summary and Conclusions

Limitations of the Evaluation

The activities performed in the course of documenting and evaluating the status of the Alliance+ project in its first year of operations have several limitations:

- While an effort was made to collect data on the components of the logic model, most of the data was collected from mentor teachers and to a lesser extent mentee teachers and school administrators. Other than casual interactions during school visits and classroom observations, no student input was sought.

- Throughout the first year the focus was on formative evaluation for the purposes of becoming acquainted with the *what* and *who* of the project, and collecting baseline information on mentor teachers' practices with technology in the classroom.

- Although the goal was to include all teachers trained as mentors through the end of the summer of 1999, only 47% returned questionnaires, and only one-third of these (about 16% of all mentors) had already implemented Internet-based activities in the classroom.

Notwithstanding the above limitations, the first year documentation and evaluation of the Alliance+ project has produced a number of significant findings. These findings have been shared with the project's management team and have resulted in corrective action and decisions to improve and extend the project's activities, and disseminate its accomplishments and successes. Findings and recommendations for improvement are presented next.

Findings and Recommendations by Model Input

1. Technology, connectivity and access

The availability of an Internet connection at school and/or in the classroom is not universal among Alliance+ schools. Despite considerable progress made in the first year, issues related to this component continue to top the list of problems identified by mentor teachers (see Table 1). The situation is analogous with respect to teacher and student access to Internet resources in the classroom. While some districts are 100% connected and can afford the latest equipment, others do not have the resources to get the project off the ground.

In addition to finding ways to overcome obstacles to connectivity and access in Alliance+ schools, it is suggested that Alliance+ teachers be encouraged to use computers at home to enhance their familiarity and expertise with resources for teaching and learning on the Internet.

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2. Training course

The degree of teacher satisfaction with the quality of the training and the curriculum has consistently been high. It appears that, in addition to following the principles of sound instructional design and being taught by competent and enthusiastic trainers with similar teaching backgrounds as the trainees, an important reason why the course has been well received is its immediate applicability in the classroom.

A suggestion is made to develop a measure (pretest) to identify a set of basic computer skills required before teachers can derive maximum benefit from the course. Prospective teacher mentees not passing the test could enroll in a basic computer skills course offered through the school district's continuing education program or the community college. A second suggestion involves making sure that the training course is scheduled over an extended period (e.g., ten or more weeks) to allow participants the time and appropriate feedback needed to apply what they learned and begin to use Internet resources in their teaching.

3. Curriculum models

CIESE has developed a Web site that provides access to many real-time databases, collaborative projects, and other Internet-based activities. Most of these activities have been aligned with national, and state curriculum standards to facilitate their integration in the classroom. As Tables 2 and 3 show, Alliance+ mentor teachers are using these resources with their students and participating in different types of Internet-based activities, including research, use of real-time data bases, problem solving, and collaborative projects. These activities encompass science, mathematics, English/language arts, social studies, and other subjects.

A suggestion is made that at all levels an effort be made to disseminate information on and involve more teachers in collaborative projects. Participation in collaborative projects should be regarded as a relatively painless and practical strategy to learn on the job how to integrate technology in the classroom. The scheduling of collaborative projects should be flexible to increase teacher participation.

4. Mentoring and support

The data gathered so far suggests that, from the mentor teachers' perspective the main evaluation criterion is being met: overall, mentors are satisfied with the training and support services received from the core trainers at the community college, the district and school technology staff, and CIESE staff.

It appears, however, that existing time constraints for many teachers and community college core team members jeopardize their ability to mentor and support mentee teachers. Three possible strategies are suggested to enhance the quality of this component . One strategy is to persuade school administrators to grant released time for mentors to work with their mentees. A second strategy involves the identification and selection of mentor candidates evidencing strong motivation and mentoring skills. The third strategy is the appointment of dedicated staff who work one-on-one with teachers on the integration of the Internet in the classroom. A combination of these strategies is likely to achieve the desired results.

5. Structural changes

So far, the Alliance+ project has relied more on bottoms-up than on top-down strategies to integrate technology in the classroom. Through the *Savvy Cyber Teacher™* training course and a network of committed curriculum developers, trainers, administrators and support staff, in the first year the project has been able to train a cadre of innovators who are already integrating the Internet into teaching and gaining valuable lessons from this experience.

As the systemic reform literature suggests, though, both bottoms-up and top-down avenues need to be pursued simultaneously for reform to take root in the classroom. Although many administrators strongly support the project, our perspective is that greater emphasis should be placed in the future on obtaining support for the project from the school board and the administration in the schools where the project is being implemented. Therefore, it is suggested that members of the community and school administration, including senior technology staff, be exposed to the potential benefits of Internet use for improving instruction in the three R's. It is also important that they be invited to attend the Alliance+ training sessions. In addition, a recommendation is made that mentor teachers be regarded as valuable resources and strongly supported to further develop their technology expertise and share their skills and insights with teachers, students, and parents in their schools and communities.

Evaluation Activities for 1999-2000

Three sets of activities will be pursued in 1999-2000 as part of the documentation and evaluation of Alliance+. The first set involves continuing to monitor issues of connectivity, classroom and home access to Internet resources, implementation of and satisfaction with the training, and mentoring. Input will be obtained from representative samples of both mentor and mentee teachers. A second set will focus on better understanding how the Internet is being used in the classroom from both the teachers' and students' perspectives. A small sample of teachers will be selected to do an in-depth analysis of the knowledge and skills involved in a variety of Internet-based learning tasks, the teaching and assessments methods being used, and the relative effectiveness of these tasks. Finally, a third set will examine issues related to the structural changes needed for the widespread use of the Internet in teaching, including awareness and attitudes on the part of school officials, financial resources, and sustainability.

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Figure 1. A Simple Logic Model for the Evaluation of Alliance+: Improving Professional Development Through Technology

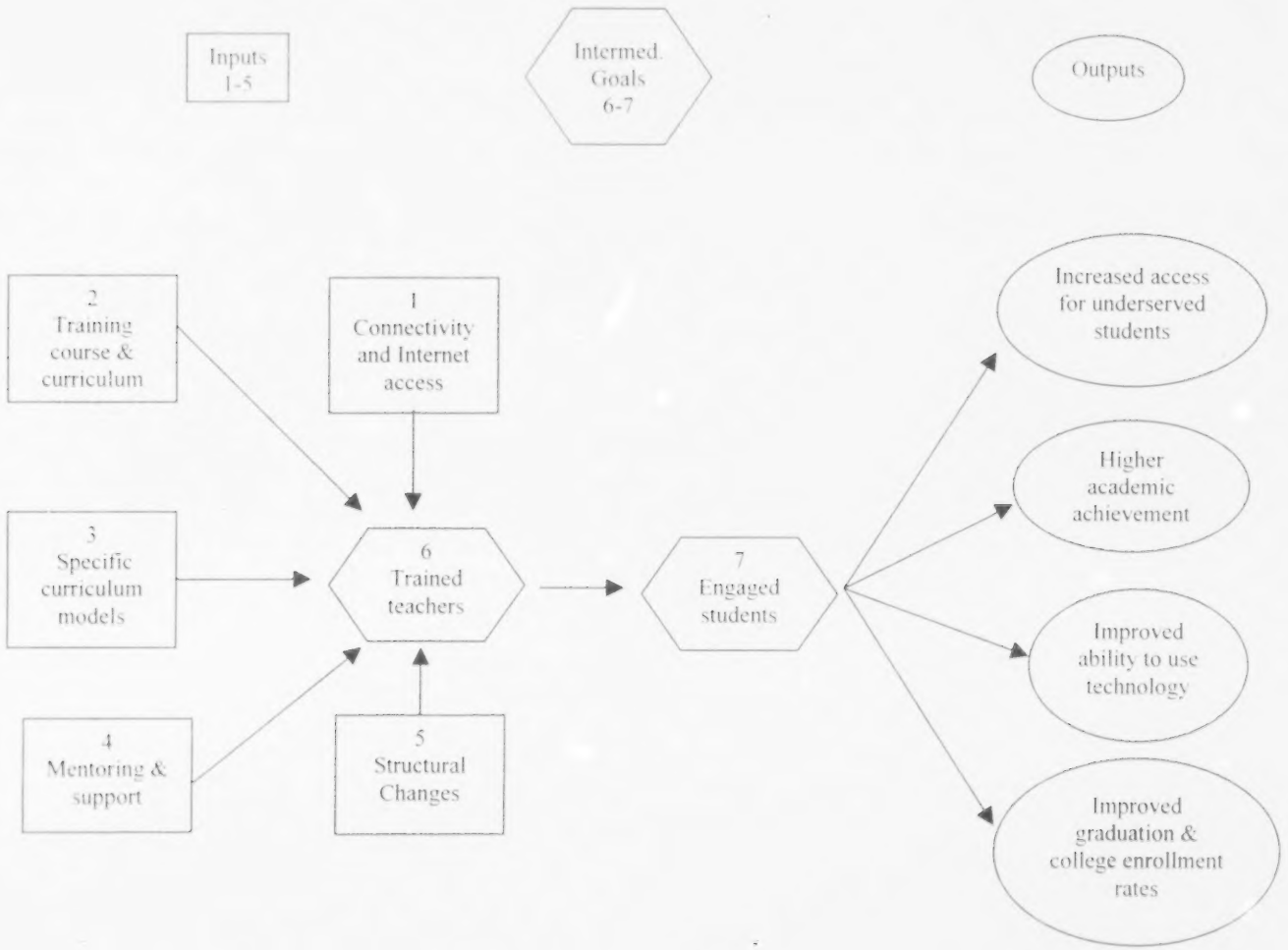

Figure 2. Framework for the Evaluation of Alliance+ for 1999-2000

Model Component	Evaluation Criteria	Evaluation Method	Status at End of Year 1 (1998-1999)	Evaluation Activities for 1999-2000
1. Connectivity & Internet access	- Availability of Internet connection in school - Teacher and student access to Internet - Availability of Internet connection at home for teachers and students	- Site directors quarterly reports - Pre and post training surveys - E-Quest - School visits - Teacher questionnaire	- Although progress has been made, about 30% of mentors and 40% of mentees do not have school Internet connection.	- Continue to use pre & post surveys & E-Quest - Use teacher questionnaire to survey mentee teachers
2. Training course & curriculum	- Degree of implementation of training - Degree of satisfaction with quality of training - Level of comfort of teachers with technology	- Site directors quarterly reports - Datafeed system - Pre & post surveys - E-Quest - Focus groups - Teacher questionnaire	- 983 teachers trained through 3-31-2000: 235 mentors, 748 mentees - High degree of satisfaction with training - Moderate level of comfort with technology	- Continue to use datafeed system, pre & post surveys, E-Quest - Use teacher questionnaire, focus groups with mentee teachers.
3. Specific curriculum models	- Availability of curriculum models - Availability of technical support and resources - Quality of the implementation	- Pre & post surveys - E-Quest - Classroom observations - Focus groups - Teacher questionnaire	- Many participants have created Web sites for use with their students - Self-reports of teachers using e-mail, real-time data bases, coll. projects	- Develop rubrics to analyze Web sites, collaborative projects, other applications - Use teacher questionnaire, focus groups with mentee teachers.
4. Mentoring & support	- Mentors' responsiveness to mentees' needs - SIT/CIESE and core team's responsiveness to mentors' needs	- E-Quest - Focus groups - Teacher questionnaire	- High degree of mentor satisfaction with support received - Need to expand and improve services for mentees	- Use teacher questionnaire, focus groups with mentee teachers.
5. Structural changes	- Availability of time, resources, and support services - Willingness of teachers to use Internet resources with students	- E-Quest - Classroom observations - Focus groups - Teacher questionnaire	- Some evidence of lack of time and know-how	- Use teacher questionnaire, focus groups with mentors and mentees.
6. Trained teachers	- Effective use of compelling applications of the Internet - Evidence of teaching practices consistent with content standards and research findings	- E-Quest - Classroom observations - Focus groups - Teacher questionnaire	- Some evidence available from teachers' Web sites and self-reports (see 3, above)	- Use teacher questionnaire, focus groups with mentors and mentees. - Develop rubrics to analyze Web sites, collaborative projects, other applications. - Develop classroom observation rubric.
7. Student engagement and learning	- Evidence of engagement - Evidence of learning and facility with technology across racial/ethnic groups	- Classroom observations - Teacher questionnaire	- Positive evidence from teacher's reports and classroom observations	- Identify quantitative and qualitative indicators and measures.